**“Evaluation of spectral indices for assessing fire severity in Victorian temperate forests, Australia”**

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**Abstract**

Spectral indices derived from optical remote sensing data have been widely used for fire-severity classification in forests from local to global scales. However, comparative analyses of multiple indices across diverse forest types are few. This represents an information gap for fire management agencies in areas like temperate south-eastern Australia, which is characterised by a diversity of natural forests that vary in structure, and in the fire-regeneration strategies of the dominant trees. We evaluate 10 spectral indices across eight areas burnt by wildfires in 1998, 2006, 2007, and 2009 in south-eastern Australia. These wildfire areas encompass 13 forest types, which represent 86% of the 7.9M ha region’s forest area. Forest types were aggregated into six forest groups based on their fire-regeneration strategies (seeders, resprouters) and structure (tree height and canopy cover). Index performance was evaluated for each forest type and forest group by examining its sensitivity to four fire-severity classes (unburnt, low, moderate, high) using three independent methods (anova, separability, and optimality). For the best-performing indices, we calculated index-specific thresholds (by forest types and groups) to separate between the four severity classes, and evaluated the accuracy of fire-severity classification on independent samples. Our results indicated that the best-performing indices of fire severity varied with forest type and group. Overall accuracy for the best-performing indices ranged from 0.50 to 0.78, and kappa values ranged from 0.33 (fair agreement) to 0.77 (substantial agreement), depending on the forest group and index. Fire severity in resprouter open forests and woodlands was most accurately mapped using the delta Normalised Burnt ratio (dNBR). In contrast, dNDVI (delta Normalised difference vegetation index) performed best for open forests with mixed fire responses (resprouters and seeders), and dNDWI (delta Normalised difference water index) was the most accurate for obligate seeder closed forests. Our analysis highlighted the low sensitivity of all indices to fire impacts in Rainforest. We conclude that the optimal spectral index for quantifying fire severity varies with forest type, but that there is scope to group forests by structure and fire-regeneration strategy to simplify fire-severity classification in heterogeneous forest landscapes. [**View Full-Text**](https://www.mdpi.com/2072-4292/10/11/1680/htm)

*Keywords:*[**wildfires**](https://www.mdpi.com/search?q=wildfires); [**fire severity**](https://www.mdpi.com/search?q=fire%20severity); [**spectral indices**](https://www.mdpi.com/search?q=spectral%20indices); [**index optimality**](https://www.mdpi.com/search?q=index%20optimality); [**obligate seeder**](https://www.mdpi.com/search?q=obligate%20seeder); **[resprouter](https://www.mdpi.com/search?q=resprouter)**; [**mixed traits**](https://www.mdpi.com/search?q=mixed%20traits); [**temperate forests**](https://www.mdpi.com/search?q=temperate%20forests)